TO: Kristie Warr

FROM: Rick Haaker, CHP, CIH

SUBJECT: Review of Las Conchas Fire Work Order 11-07023
(Chain of Custody No. 6-070411-123526-0004)

DATE: 7/27/2011

Sr-90 results for this sample set are transmitted by a different memo.

This is an update to a memo that was dated 7/22/2011. It clarifies the basis for assigning the data qualifiers JH and JL as described below. Data transmitted prior to 7/26/2011 had the qualifiers JH and JL reversed on a small number of results. Two results were affected in this sample set as indicated in Table 0.

Table 0. Sample Results With Changed Qualifiers

ClientID	Isotope	Assigned Qualfier
A012-110704-0821-1-T01	U-235	JL
A004-110704-0840-1-T01	PU-238	JH

The XLS format data file referenced as an attachment to this memo corrects these assignments where appropriate. Also this memo transmits additional subsidiary calculations for “Net Concentration” and “Net Concentration Propagated Error.”

The data were reviewed for accuracy, completeness, and any apparent issues. During data review a qualifier “UB” was assigned if the activity result is less than five times the activity result of the method blank. A “UB” qualifier denotes that an analyte is non-detect due to lack of activity relative to a blank concentration. Unused filters from the same lot as the sample filters were used as the method blank. The analytes in Table 1 were detected in the method blank, and all samples are affected.

Table 1. Analytes detected or tentatively detected in the method blank and data qualifiers based on the blank.

BlanksWithDetectedOrEstimatedActivity	
Isotope	Assigned Qualfier
U-234	
U-238	

BlanksWithDetectedOrEstimatedActivity	
Isotope	**Assigned Qualfier**
GROSS BETA	

Data without a UB qualifier was further reviewed.

A “U” was assigned to the Assigned Qualifier column when result was less than 50% of the MDA. In this case the analytical result was assigned to be one-half of the MDA in the "ValidatedResult" column. The validated result should be considered an upper bound estimate in this case.

A “J” was assigned if the result was between 0.5 of the MDA and the MDA. The validated result is the reported result. The validated result represents an estimated value in this case.

A “JH” or “JL” would be based on percent recovery (the "RadioPercentRec", and “GravPercentRec” columns of the Eberline Services report. Below 70% would result in assignment of a JH to denote that the reported result is estimated with more uncertainty than usual, and with a potential positive bias. Recoveries above 130% would result in assignment of a JL to denote that the reported result is estimated with more uncertainty than usual, and with a potential negative bias.

Table 2 lists samples that exhibited percent recoveries outside of the acceptance range.

Table 2. Samples with recoveries outside of the acceptance range.

NonAcceptanceRecoveries			
Isotope	**ClientID**	**RadioPercentRec**	**Assigned Qualfier**
U-234	A008-110704-0710-1-T02	131.85	U
U-234	A009-110704-0630-1-T01	137.07	UB
U-234	A010-110704-0748-1-T01	146.63	UB
U-234	A012-110704-0821-1-T01	131.2	UB
U-234	A012-110704-0825-2-T01	142.35	UB
U-235	A008-110704-0710-1-T02	131.85	UB
U-235	A009-110704-0630-1-T01	137.07	UB
U-235	A010-110704-0748-1-T01	146.63	UB
U-235	A012-110704-0821-1-T01	131.2	JL
U-235	A012-110704-0825-2-T01	142.35	U
U-238	A008-110704-0710-1-T02	131.85	UB
U-238	A009-110704-0630-1-T01	137.07	UB
U-238	A010-110704-0748-1-T01	146.63	UB

NonAcceptanceRecoveries			
Isotope	ClientID	RadioPercentRec	Assigned Qualfier
U-238	A012-110704-0821-1-T01	131.2	UB
U-238	A012-110704-0825-2-T01	142.35	UB
AM-241	A001-110704-0943-1-701	46.75	U
AM-241	A012-110704-0821-1-T01	65.28	U
PU-238	A004-110704-0840-1-T01	60.13	U
PU-238	A001-110704-0943-1-701	53.51	U
PU-238	A002-110704-0850-1-T01	40.41	U
PU-238	A004-110704-0840-1-T01	67.22	JH
PU-238	A006-110704-0922-1-T01	48.35	U
PU-238	A008-110704-0710-1-T02	66.13	U
PU-239	A004-110704-0840-1-T01	60.13	U
PU-239	A001-110704-0943-1-701	53.51	U
PU-239	A002-110704-0850-1-T01	40.41	U
PU-239	A004-110704-0840-1-T01	67.22	U
PU-239	A006-110704-0922-1-T01	48.35	UB
PU-239	A008-110704-0710-1-T02	66.13	U

The assigned data qualifiers are found in column “AssignedQualifier”.

The effective air volume for the various analytes of the various air samples in cubic meters are provided in the column “AliquotNetEquiv” of the EDD.

Note that the blank results are in pCi/m^3. The volumes that Eberline Services assigned to the blanks for a given analyte are the average of the effective volumes for the samples in the sample set for that analyte.

Air volumes that were collected in this sample set were in the range of 518 to 613 cubic meters. There is no indication of whether the air volumes on the Chain of Custody represent the sample air volumes at standard temperature and pressure.

The period of time between collection of air samples and gross alpha/beta counting was about seven days, so those results are unlikely to be affected by the presence of radon daughters.

No discrepancies were found in the transcription of sample IDs or sample volumes from the chain of custody to the EDD.

Sample A001-110704-0943-1-701 carries UB qualifiers for U-234 and U-238 only because their activities in the sample were less than 5 times that of the blank. No UB qualifier was necessary for U-235 because the activity exceeded 5 times the measured value n the blank. All three of the results carry a high uncertainty and the Eberline Services results in the EDD do not have the method blank activity subtracted from them.

Net Concentration

Eberline Services reported concentration and uncertainty results which were corrected for instrument background. They also reported concentration and uncertainty results for the method blank. They did not report "net concentration", which is the sample result minus the result for the method blank, probably because their written procedure does not include that calculation and it was not specified in the Purchase Order. The "Net Concentration" is the concentration result reported by Eberline Services corrected for the contribution of the method blank. The net concentration may be calculated from Eberline Services data as indicated in equation 1.

Equation 1.

Net Concentration = (Result * Sample Volume – Blank Result * Blank Volume)/Sample Volume

In equation 1 the *sample volume* is the sample air volume from the chain of custody times the fraction of the sample filter allocated to the particular analysis. The blank volume is the average of the *sample volumes* for all samples submitted on a particular chain of custody times the fraction of the sample filter allocated to the particular analysis. Negative net concentrations were assigned a concentration of zero after this calculation.

Net Concentration Propagated Error

The propagated errors "Uncertainty" in the Eberline Services EDD are, according to their written procedure, based on a 95% confidence interval. The Net Concentration Propagated Error (NPCE) was calculated as indicated in equation 2.

Equation 2.

$$NPCE = [[(\text{Uncertainty Result} * \text{Sample Volume})^2 + (\text{Uncertainty Blank Result} * \text{Blank Volume})^2]^{0.5})/\text{SampleVolume}$$

The Net Concentration Propagated Error result is in a column entitled ErrorNet in the supplemental excel data file, which is attached.

Minimum Detectable Activity (MDA)

The equations for MDA in the Eberline Services written procedure assume that

the count time for the sample and the background counts are the same. The results for background count rate in the EDD appear to be truncated to one significant digit, so it is unlikely the MDA results reported by Eberline Services can be replicated exactly by an independent calculation.

Percent Recovery of Tracer

The denominators of the concentration result, MDA, and uncertainty equations in the Eberline Services written procedure include a factor for percent recovery of the tracer. The alpha spectroscopy results reported by Eberline Services in the EDD should incorporate this factor.

References

AP-018 Operation of the Alpha Spectroscopy System, Eberline Services Oak Ridge Laboratory Analytical Procedure, October 31, 2010.

Attachment

LasConchas-11-07023.accdb supplement7-27-11.XLS